

Symposium on the Chemistry and Toxicology of Acrylamide

Acrylamide ($\text{CH}_2=\text{CH}-\text{CONH}_2$), an industrially produced α,β -unsaturated amide, is used worldwide to synthesize polyacrylamide. The polymer has found many applications as a soil conditioner, in wastewater treatment, in the cosmetic, paper, and textile industries, and in the laboratory as a solid support for the separation of proteins by electrophoresis. Monomeric acrylamide is also widely used by researchers as an alkylating agent for the selective modification of protein SH groups and in fluorescence studies of tryptophan residues in proteins. Because of the potential of exposure by individuals to acrylamide, the effects of this compound in cells, tissues, animals, and humans have been studied extensively. Neurotoxicity, reproductive toxicity, genotoxicity, clastogenicity (chromosome-damaging effects), and carcinogenicity have been demonstrated to be potential human health risks that may be associated with exposure to acrylamide.

In 2002, reports that acrylamide was found at levels up to 3 mg/kg in plant-derived foods that had been heated at frying or baking temperatures resulted in greatly heightened worldwide interest in the chemistry and safety of acrylamide. The Maillard reaction between the amino acid asparagine and reducing sugars was shown to be responsible for its formation in foods. This heat-induced reaction of amino groups of amino acids with carbonyl groups of carbohydrates, such as glucose, also results in the concurrent formation of Maillard browning products contributing to desirable flavor and color. Consequently, strategies for the mitigation of acrylamide may adversely affect the desirable quality attributes of fried and baked foods.

The realization that exposure of humans to acrylamide can come from the diet as well as from external sources clearly demonstrated the need for developing a better understanding of its formation and distribution in food and how its presence in the diet may affect human health. Recent reports linking dietary acrylamide with increased incidence of endometrial and ovarian cancer in women reinforces the need to reduce the acrylamide content of the diet and to mitigate adverse *in vivo* effects after consumption. A better understanding of the chemistry and biology of acrylamide in general and its impact in a food matrix, in particular, can lead to the development of improved food processes to decrease the acrylamide content and thus the safety of the diet.

To catalyze progress, we organized a Symposium on the Chemistry and Safety of Acrylamide in Food held in Anaheim, CA, in March 2004, sponsored by the Division of Agricultural and Food Chemistry of the American Chemical Society. The proceedings of the Anaheim symposium were published in 2005 by Springer of New York as Volume 561 in the *Advances in Experimental Medicine and Biology* Series.

Because of the extraordinary amount of worldwide progress following the Anaheim symposium, we were invited by the Division of Agricultural and Food Chemistry to organize a

second 3-day symposium on the Chemistry and Toxicology of Acrylamide, which took place at the American Chemical Society Meeting in Boston, MA, August 19–23, 2007.

It is now six years since acrylamide was first reported in food, and much research has been undertaken worldwide to understand the chemistry and toxicology of this compound and to find means of mitigating levels in a variety of processed foods while maintaining desirable quality attributes. The multidisciplinary symposium provided an opportunity to discuss recent research that has been undertaken internationally. The main objectives of both symposia were to cross-fertilize ideas and to stimulate new research on the consequences of acrylamide in the diet and ways to minimize its formation. We invited participants to contribute reviews and reports of recent work on the following aspects of acrylamide chemistry, pharmacology, toxicology, and safety:

- metabolism and mechanisms of toxicity
- risk assessment and epidemiology
- biomarkers of consumption
- chemistry of acrylamide formation in food
- analysis and distribution in the food chain
- mitigation and effects on food quality

To our pleasant surprise, nearly everyone invited came to Boston to participate. Furthermore, those who could not attend agreed to contribute a paper to the proceedings. The distinguished international participation from 12 countries increases the authority and usefulness of the proceedings. At the invitation of the Editor, Dr. James Seiber, we agreed to publish the proceedings in a single issue of the *Journal of Agricultural and Food Chemistry*. The 27 papers appear in the subject order outlined above.

We are grateful to all contributors for their help in bringing the symposium and published proceedings to fruition, to the Division of Agricultural and Food Chemistry of the American Chemical Society for sponsoring the symposium, and to Dr. Seiber for his invitation to publish the proceedings in the *Journal*.

We hope that the published papers will be a valuable record and resource for further progress in this very active interdisciplinary field.

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JF801610E